Technical Report CADD-93-1
June 1999
(Updated)

Tri-Service CADD/GIS
Technology Center

CADD Details Library

Report 4
Hazardous, Toxic, and Radioactive Waste (HTRW) Details

Published by U.S. Army Engineer Research and Development Center,
Waterways Experiment Station

Library of CADD Details

Report 1	Architectural Details
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Hazardous, Toxic, and Radioactive Waste (HTRW) Details

by Tri-Service CADD/GIS Technology Center

U.S. Army Engineer Research and Development Center
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Report 4 of a Series

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Contents

Summary

Several years ago, before computer-aided design and drafting (CADD) became the standard drafting tool in design, a seasoned draftsman might require, on the average, 40 hours to develop a sheet of construction details by hand. Through the use of CADD, the effort of creating a single detail has been reduced considerably. Once the designer has created a detail using CADD tools, he/she can save the detail to a file and use the detail over and over in different construction projects. Eventually, the designer will have compiled a library of details that he/she will consistently use. These details can be easily inserted into a detail sheet and then modified to meet the project requirements and specifications. This development and reuse of CADD details represents a considerable time-savings tool to the designer.

When the Tri-Service CADD/GIS Technology Center (the Center) was established in 1992, one of the first tasks was the compilation of a CADD Details Library utilizing details created by tri-service personnel. The Center did not expend design funds to hire an architect/engineer or use in-house resources to develop completely new details; instead these tri-service details were organized into a generic format and cataloged by type.

To further simplify the use of the details library, the former Architectural Automation Field Working Group (AAFWG) tasked the Center to develop an icon-driven software retrieval system. Developed using MDL and AutoLISP programming, the retrieval software ran on both MicroStation and AutoCAD platforms using UNIX, DOS, Windows, Windows NT, and Windows 95 operating systems.

Typically, detailing on a design project does not begin prior to the 35-percent design phase. At the 35-percent phase, the designer has defined the building's structure and envelope requirements and is ready to begin selecting typical project details.

After reviewing details in hardcopy or electronic format and identifying usable details, the designer/draftsman initiates the "CADD Detail Manager" program. The designer scrolls through the details listing, identifies the desired detail, reviews it within the display box, selects the required scale, and then places it on the detail sheet. This process is repeated until the entire sheet is filled. Simple modifications to the details in order to meet specific job requirements/specifications complete the sheet. The designer may call up the CADD Detail Manager while in any design file, thus enabling detail placement anywhere within a set of drawings.

The CADD Details Library should always be considered a "living" library. Since the conception of the idea for this project, this philosophy has proven to be true. In 1995 the Center released the first CADD Details Library CD-ROM to enthusiastic response. The first CD-ROM contained over 1,200 details representing the Architectural; Mechanical; Electrical; and Hazardous, Toxic,

and Radioactive Waste disciplines. User demand resulted in the addition of Civil/Site, Structural, Interior Design, and Landscape Architectural details to the current edition of the CADD Details CD-ROM. With the push toward using the metric system in the tri-services, 100 of the architectural details contained in the first CD-ROM were converted to metric format. Because of the desire for a "paperless" environment, all documents related to the current version of the CADD Details Library have been released totally in electronic format on the CD-ROM. This gives the designer the option of printing out only the documents (or only the pages) that he/she requires, thereby saving printing costs for the Center. Through efforts such as these, the CADD Details Library will continue to grow to include all the design disciplines with costs incurred for technical review/modification, CD-ROM reproduction, and distribution.

It is the Center's hope that the efforts of the Center, with the backing of the former Field Working Groups and the currently existing Design/Construction Field Working Group, to develop comprehensive, multidiscipline sets of generic details will not only help designers in their daily work but also demonstrate the tri-service commitment to CADD productivity.

Preface

This report is the fourth volume of a series of reports consisting of architectural; mechanical; electrical; hazardous, toxic, and radioactive waste (HTRW); structural; and civil/site details. These reports are part of the Tri-Service CADD/GIS Technology Center's (the Center) initiative to develop a standard methodology for the development, documentation, and use of generic design details in computer-aided design and drafting (CADD) systems. By providing both a startup set of details and a menu-driven software retrieval program, the Center hopes to ensure easy accessibility to generic design details and encourage their use in the CADD environment.

It must be emphasized that the intent of this document is not to provide "Standard Details," but to furnish CADD users with a starting point for the development of project-specific details. Although reasonable efforts have been made to verify that the enclosed details are technically correct and meet existing, generally available building code requirements, there is no expressed or implied warranty of correctness or compliance. It is the final responsibility of the user/designer to ensure the accuracy, completeness, applicability, workability, and code compliance of all details whether used or misused in whole or in part.

Project Manager for the CADD Details Library was Stephen C. Spangler of the Center. Original authors of the CADD Details Library reports were James T. Wilson and Stephen C. Spangler of the Center. Chief of the Center was Harold L. Smith. The Center is located in the Information Technology Laboratory (ITL), U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, a complex of five laboratories of the U.S. Army Engineer Research and Development Center (ERDC). During preparation and publication of this report, Director of ITL was Dr. N. Radhakrishnan, and Commander of ERDC was COL Robin R. Cababa, EN. This report was prepared and published at the WES complex of ERDC.

The Center would like to thank Mr. Stan Shirk, Omaha District, for his continued devotion and efforts to the CADD Details Library project. The Center would also like to recognize Mr. Todd Blakley, formerly of the Sacramento District, for his contributions as former chairman of the Design/Construction Field Working Group's (FWG) Details Subcommittee. A special acknowledgment goes to Mr. Stephen Goodin, South Atlantic Division, and Mr. Alain Bernier, Southwestern Division, for their support in the initial development of the details library concept.

The Tri-Service CADD/GIS Technology Center would like to acknowledge the contributions of the following sites who helped in submitting and/or formatting details for this release of the CADD Details Library.

Brooks Air Force Base

Department of Veterans Affairs

Naval Air Station, Fort Worth

NAVFACENGCOM, Western Division

Navy Public Works Center, Washington, D.C.

Tinker Air Force Base

U.S. Army Corps of Engineers, Charleston District

U.S. Army Corps of Engineers, Fort Worth District

U.S. Army Corps of Engineers, Little Rock District

U.S. Army Corps of Engineers, Mobile District

U.S. Army Corps of Engineers, Omaha District

U.S. Army Corps of Engineers, Pacific Ocean Division

U.S. Army Corps of Engineers, Pittsburgh District

U.S. Army Corps of Engineers, Sacramento District

U.S. Army Corps of Engineers, Seattle District

U.S. Army Corps of Engineers, Transatlantic Programs Center

U.S. Army Engineering and Support Center, Huntsville

Design/Construction FWG Details Subcommittee

Stan Shirk (Chairman), U.S. Army Corps of Engineers, Omaha District

Elbert Godwin, U.S. Army Corps of Engineers, Fort Worth District

Mark Hall, Department of Veterans Affairs

Lee Meier, Scott Air Force Base, IL

Jerry Sakahara, U.S. Army Corps of Engineers, Sacramento District

Stephen Spangler, Tri-Service CADD/GIS Technology Center

Beneficial comments (recommendations, enhancements, deletions, etc.) which may be of use in improving this document should be addressed to:

U.S. Army Engineer Research and Development Center, Waterways Experiment Station
Tri-Service CADD/GIS Technology Center
ATTN: CEWES-ID-C/Spangler
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

1 Introduction

The use of computer-aided design and drafting (CADD) systems within the Department of Defense (DoD) has produced an increase in design efficiency while netting an appreciable reduction in overall design cost. In some offices, a 30- to 40-percent reduction in design/drafting man-hours, over the traditional “on-the-board” design effort, has been realized. These improvements have been achieved through the utilization of discipline-specific CADD design packages, the sharing of CADD-developed project information, and the reuse of design information. Recognizing the increased productivity represented in the reuse and adaptation of design and construction details, the Tri-Service CADD/GIS Technology Center (the Center) initiated a project to collect and disseminate generic design details within the DoD.

Based on work completed by the former Mechanical Field Working Group in November 1991, and ongoing work by the former Electrical and Architectural Automation Field Working Groups, the Center recognized the necessity to pool the resources of all DoD design disciplines to ensure consistency in detail development. Issues concerning scale, levels/layers, line thickness, text, colors, layout, naming convention, and file storage/retrieval procedures needed to be resolved to the satisfaction of all the design disciplines before the Center could continue. The Center tasked the former Architectural Automation Field Working Group to prepare applicable criteria and procedures for standardizing the development of the CADD Details Library.

In accordance with the Metric Conversion Act of 1975 (Public Law 94-168) as amended by the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418), and Executive Order (EO) 12770 dated July 25, 1991, this and future editions of the CADD Details Library will include Standard International (metric) details. Appendix B contains information on changes that will occur in design drawings and construction as a result of the conversion to the metric system.

2 CADD Details Library

Library Creation

"Evolution" is the best description of the process for incorporating the suggested format for creating generic details. Agencies currently developing detail libraries are encouraged to begin incorporating the format into their daily design efforts, and not attempt a complete revamping of their existing detail libraries. As details are created, they should be included in the agency's detail library and submitted to the Center for possible inclusion in the DoD-wide master library. By no means should the CADD Details Library ever be considered a completed product. It is only the **beginning** of what should be a daily routine of adding and revising details for all design disciplines within the tri-services.

Detail Integrity

Although a liability disclaimer covering all the details is included as part of the CADD Details Library, each detail submitted for inclusion into the library should be reviewed by the submitting agency for integrity and compliance with current design criteria. It will be extremely helpful to the Center and the Design/Construction Field Working Group's Details Subcommittee if each detail is properly reviewed prior to submitting it for placement into the Library.

Creating a Detail

Graphics

When developing a detail, draw the detail at full size (1 inch = 1 inch (inch-pound) or 1 mm = 1 mm (metric)) (Figure 1). Each detail should exist in an individual drawing file, either in AutoCAD's .dwg or MicroStation's .dgn formats. MicroStation details should not be created as cells or as part of a cell library. AutoCAD details should not be saved as blocks or blocks written out to a file (wblocks).

For detail uniformity, a standard detail layout has been developed (Figures 2 and 3). This box is only a guide for laying out details; it is understood that not all details can fit into the layout. When producing details larger than the standard detail layout box, every effort should be made to follow the format as much as possible. For example, keep the detail origin and title in the lower left corner of the detail and try to use multiples of the standard detail layout box (2 high, 2 wide, etc.).

Working units

For MicroStation details, the working units should be set to 1:12:8000 (ft:in:PU) for inch-pound details and 1:1:10 (mm:none:PU) for metric details. For AutoCAD details, the default "UNITS" setting should be "#4 Architectural" for inch-pound details and "#2 Decimal" for metric details.

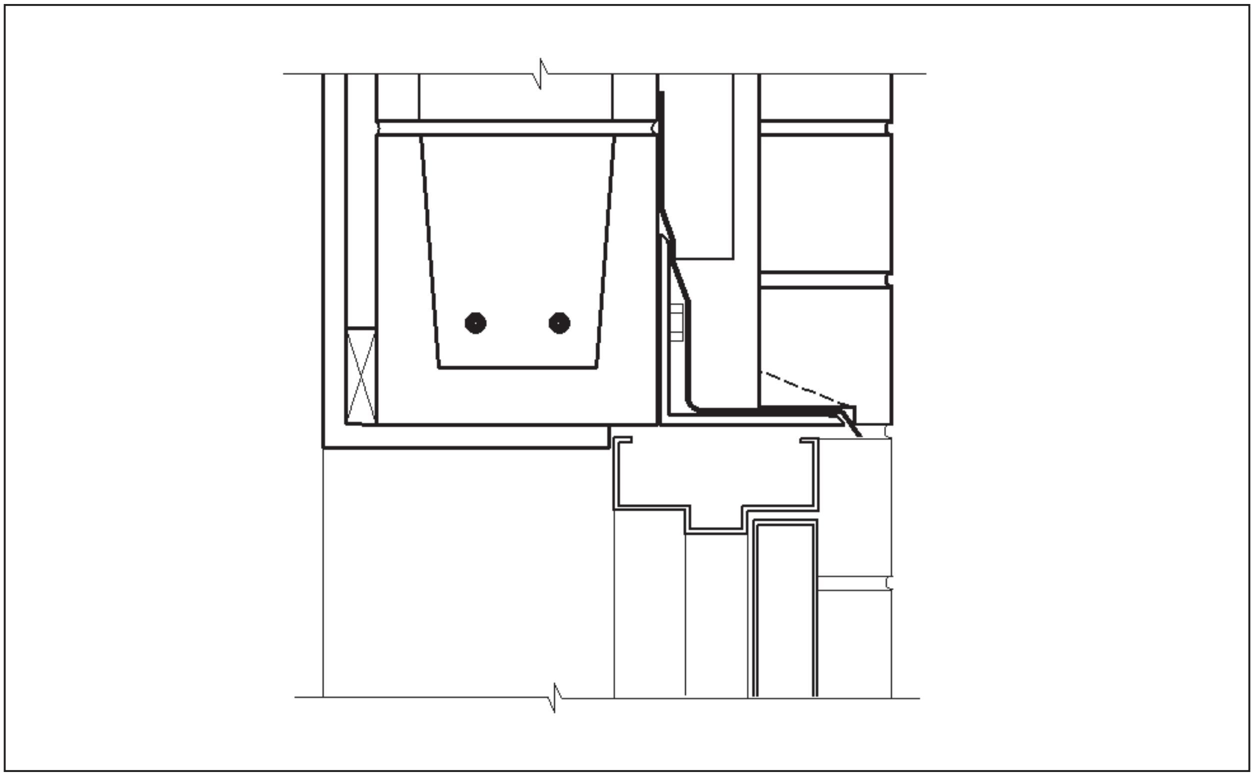

Figure 1. Detail drawn at full size

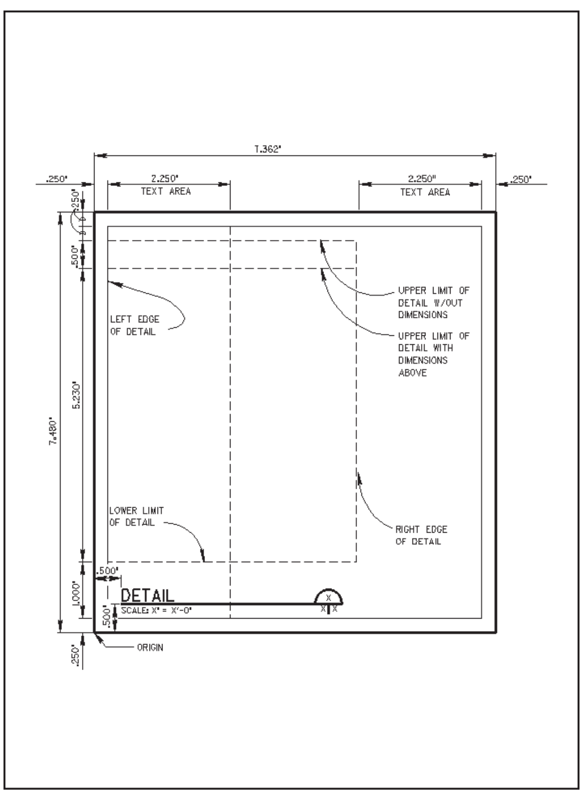

Figure 2. Inch-pound detail layout box

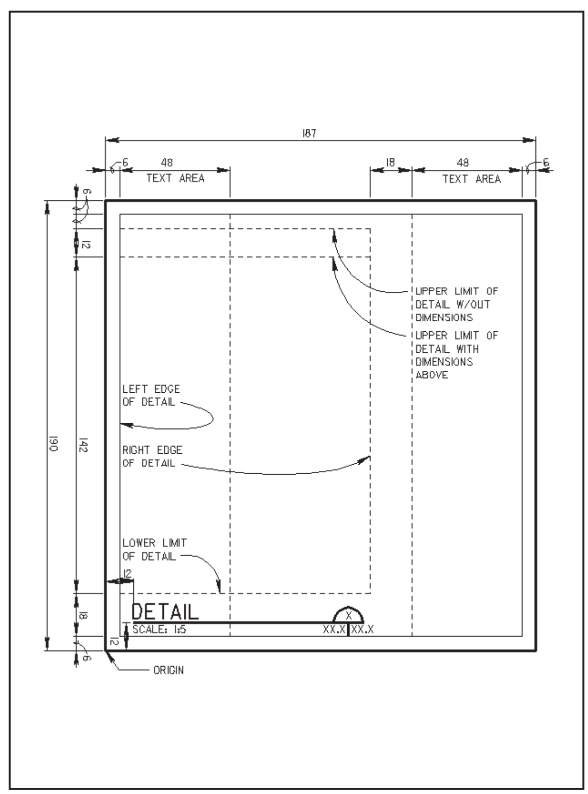

Figure 3. Metric detail layout box

Levels/layers

The previous edition of the CADD Details Library proposed a level/layer scheme based on the pen weight at which graphics would be plotted. Feedback from the field indicated that this was too restrictive and unclear. Users want to be able to "turn off" individual components of a detail versus all items drawn at a certain line weight. For instance, a designer may want to be able to turn off the CMU in a detail but not the reinforcing rebar.

As a result of this input, levels/layers for details have been developed for Release 1.8 of the Tri-Service A/E/C CADD Standard (Table 1). Levels/layers are grouped into the most common construction materials/items required to create a particular discipline's details.

Color/line widths

The primary purpose of color is to provide a drawing with visual depth and clarity or, in some CADD systems, to assign plotted line widths. The previous edition of the CADD Details Library established a specific color and line weight to each level/layer. Users found this guideline to be too restrictive. Often a user will want to show items on the same level/layer at different line weights to emphasize particular parts of a detail over others. As a result, the user may use any of the colors shown in Table 2 to create details. However, the line weights shown in the table beside each color *have* to be associated with that color in order to ensure that details are plotted at the correct visual weight.

Patterning/hatching

Patterning/hatching should be added to the detail on level/layer H-ANNO-PATT (Figure 4). When the detail is being patterned or hatched, only the default pattern or hatch libraries supplied with MicroStation or AutoCAD should be used.

Text

After the scale of the detail is determined, text should be placed at heights corresponding to Tables 3 and 4. This ensures that all notes and dimensions will be plotted at a height of 1/8 inch (3 mm) and the detail title will be plotted at a height of 1/4 inch (6 mm). For example, in Figure 5, the notes should be placed at a height of 1/2 inch and the detail title should be placed at a height of 1 inch for a detail that is plotted at a scale of 3" = 1' - 0". The text style used for details should be Font 1 for MicroStation users and "ROMANS" for AutoCAD users.

Abbreviations

Abbreviations for words or phrases frequently used in details should be as noted in Appendix A. When possible, abbreviations should be kept to a minimum. Other abbreviations, particularly discipline-unique abbreviations, may be used but must not conflict with those in Appendix A.

Detail Naming

File names for the master set of details are based on *UniFormat* (Interim Edition) produced by the Construction Specifications Institute (CSI); *UniFormat* is used with permission from CSI. *UniFormat* may be purchased from CSI by calling (800)689-2900. Level 1 and Level 2 *UniFormat* categories are used for the first three alphanumeric characters of the file name. The Code, Sub-Code, Detail Number, and graphic type characters are non-*UniFormat* conventions developed specifically by the Center for the CADD Details Library file naming methodology (see Figure 6).

Table 1
HTRW Detail Levels/Layers

Level #	Level/Layer Name	Level/Layer Description
1	H-ANNO-DIMS	Witness/extension lines, dimension arrowheads/dots/slashes, dimension text
3	H-ANNO-NPLT	Construction lines, area calculations, review comments
4	H-ANNO-PATT	Patterning/hatching
6	H-ANNO-SYMB	Reference bubbles, matchlines and breaklines
7	H-ANNO-TEXT	Detail title text, leaderlines/arrowheads and associated text, notes
9	H-DETL-GENF	General features
10	H-DETL-ACCS	Accessories
19	H-DETL-CONC	Concrete
29	H-DETL-FILL	Fill/cover material
41	H-DETL-MEMB	Membrane/netting
44	H-DETL-PIPE	Pipe and conduit
45	H-DETL-PUMP	Pumps
49	H-DETL-STRC	Structural features
50	H-DETL-TANK	Tanks
56	H-DETL-VLVE	Valves and fittings
57	H-DETL-WIRE	Wiring

Table 2
Color/Line Width Guidelines

Color	AutoCAD Color #	MicroStation Color #	Line/Pen Width
Blue	5	1	0.007 in. (0.18 mm), LW = 0
Grey	8	9	0.007 in. (0.18 mm), LW = 0
Red	1	3	0.010 in. (0.25 mm), LW = 1
Green	3	2	0.010 in. (0.25 mm), LW = 1
Yellow	2	4	0.014 in. (0.35 mm), LW = 2
Magenta	6	5	0.014 in. (0.35 mm), LW = 2
Cyan	4	7	0.020 in. (0.50 mm), LW = 3
White	7	0	0.028 in. (0.70 mm), LW = 5

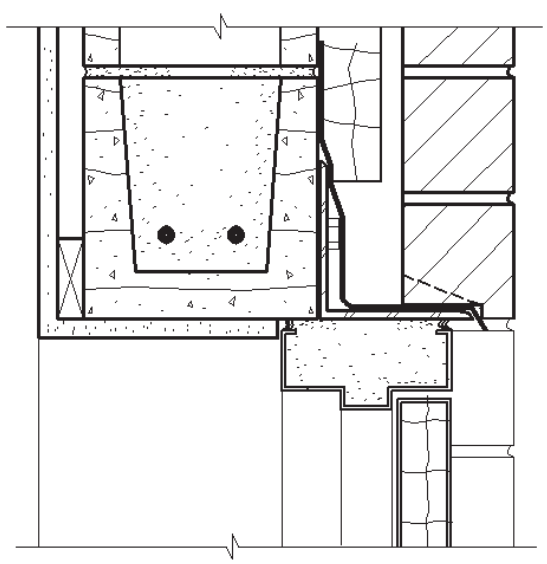

Figure 4. Patterning/hatching added to detail

Table 3 **Inch-Pound Text Heights**		
Detail Scale	**Height at which Notes and Dimensions Should be Placed**	**Height at which Detail Title Text Should be Placed**
1/32 in. = 1 ft - 0 in.	4 ft	8 ft
1/16 in. = 1 ft - 0 in.	2 ft	4 ft
1/8 in. = 1 ft - 0 in.	1 ft	2 ft
1/4 in. = 1 ft - 0 in.	6 in.	1 ft
3/8 in. = 1 ft - 0 in.	4 in.	8 in.
1/2 in. = 1 ft - 0 in.	3 in.	6 in.
3/4 in. = 1 ft - 0 in.	2 in.	4 in.
1 in. = 1 ft - 0 in.	1-1/2 in.	3 in.
1-1/2 in. = 1 ft - 0 in.	1 in.	2 in.
3 in. = 1 ft - 0 in.	1/2 in.	1 in.
6 in. = 1 ft - 0 in.	1/4 in.	1/2 in.
Full Size	1/8 in.	1/4 in.

Table 4 **Metric Text Heights**		
Detail Scale	**Height at which Notes and Dimensions Should be Placed**	**Height at which Detail Title Text Should be Placed**
1 : 200	600 mm	1200 mm
1 : 125	375 mm	750 mm
1 : 100	300 mm	600 mm
1 : 75	225 mm	450 mm
1 : 50	150 mm	300 mm
1 : 25	75 mm	150 mm
1 : 20	60 mm	120 mm
1 : 10	30 mm	60 mm
1 : 5	15 mm	30 mm
1 : 2.5	7.5 mm	15 mm
Full Size	3 mm	6 mm

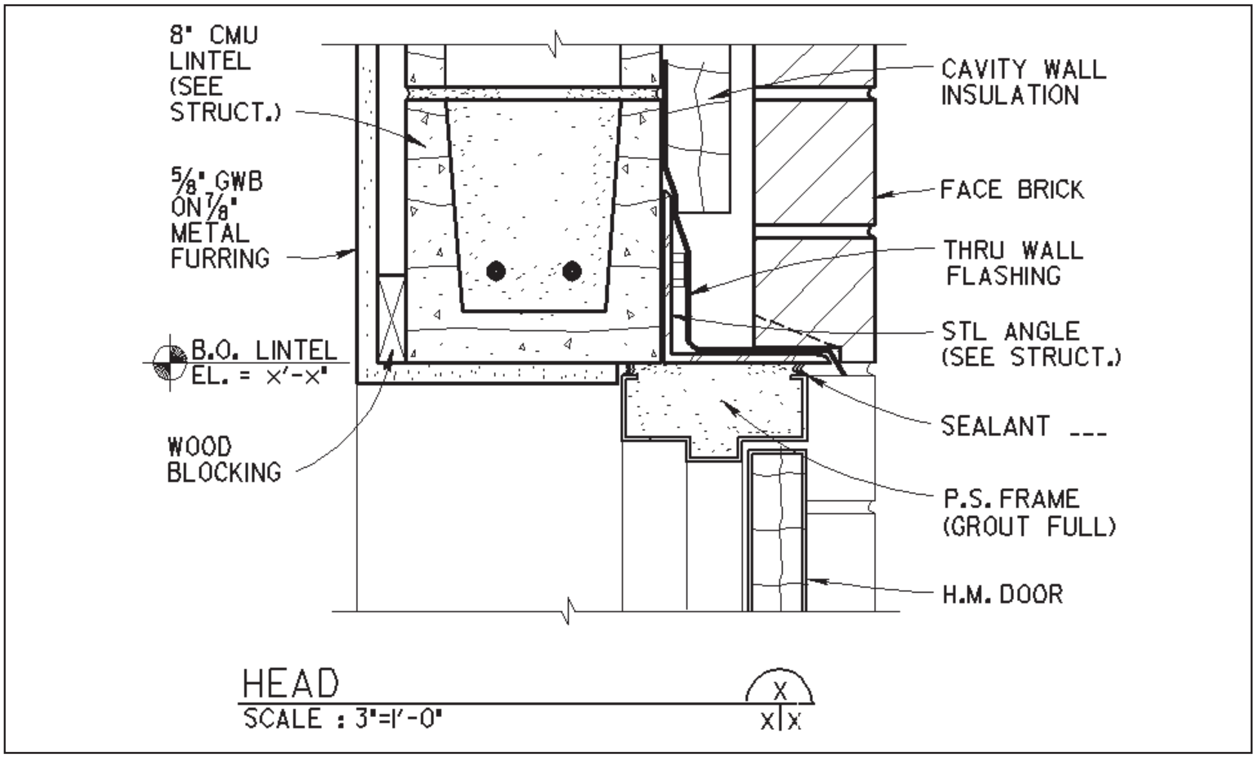

Figure 5. Text, dimensions, leader lines, and titles added to detail

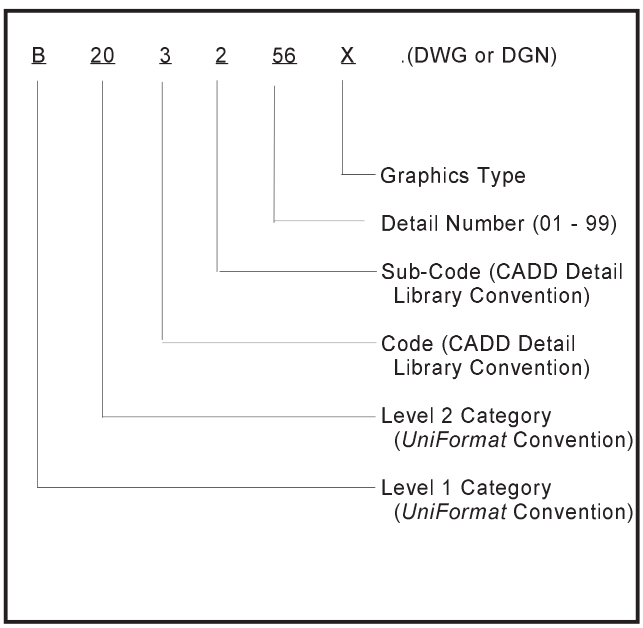

Figure 6. Naming convention. Note: A full listing of *UniFormat* categories and codes is outlined in Chapter 5, “Index of Details”

An example of a detail name is provided below.

EXAMPLE: A102352P.dwg

Level 1 Category:
A = Substructure

Level 2 Category:
10 = Foundations

Code:
2 = Special Foundations

Sub-Code:
3 = Shoring and Underpinning

Detail Number:
52 = Detail #52

Graphics Type:

E = Elevation	P = Plan
I = Isometric	S = Schematic
N = Notes	X = Section

3 CADD Detail Manager

Introduction

The CADD Details Library is supplied on a CD-ROM with a menu-driven retrieval system called the CADD Detail Manager (CDM). The CDM allows the user to select border sheets, preview details, and scale details for proper placement into a drawing file.

Details are located within the CDM by selecting a Discipline (e.g., Architectural, Mechanical, etc.), a combination of Level 1 and Level 2 Categories (e.g., Exterior Closure, Roofing, etc.), and the Detail Code (e.g., Exterior Walls, Exterior Windows, etc.). Once all three selections are made, a list of details within the selected code for that discipline will be displayed. Individual details may be previewed by selecting (highlighting) the detail names displayed within the list box. Choosing the appropriate scale and inserting the detail into the current drawing completes the selection/placement process.

Startup

Although the AutoCAD and MicroStation versions of the CDM function similarly, there are minor differences in the way these utilities work. These differences will be discussed in the following sections.

MicroStation Version (95/SE)

The MicroStation version of the CADD Detail Manager was developed using MicroStation Development Language (MDL). To start the CADD Detail Manager, create a new or open an existing design file. In the MicroStation Key-in window, enter the following command:

mdl load detail

When this command is entered, the CADD Detail Manager disclaimer box will open. After the “OK” button is clicked, the CADD Detail Manager Setup box will appear (Figure 7). From this point on, the use of the CADD Detail Manager in either AutoCAD or MicroStation is the same (see “CADD Detail Manager Setup”).

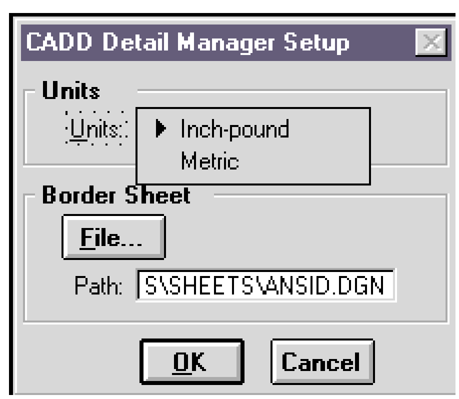

Figure 7. Detail Manager Setup box

AutoCAD Version (Release 13/14)

The AutoCAD version of the CADD Detail Manager was developed using AutoLISP. To start the CADD Detail Manager within AutoCAD, first open a new drawing. At the Command line, the following needs to be typed:

Command: CDM

When this command is entered, the CADD Detail Manager disclaimer box will open. After clicking on the "OK" button, the user will have the choice of either starting a new detail sheet or opening an existing detail sheet (Figure 8).

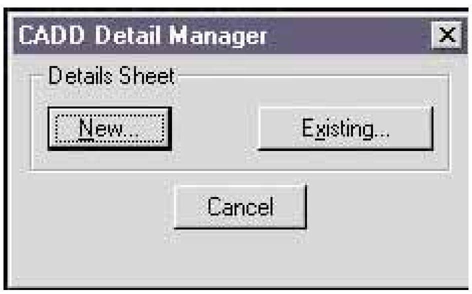

Figure 8. New or existing sheet option box

Choosing the New option from Figure 8 starts the CADD Detail Manager Setup (Figure 7). From this point, the use of the CADD Detail Manager in either AutoCAD or MicroStation is the same.

Choosing the Existing option will allow the user to search for an existing details sheet using a file manager routine (Figure 9).

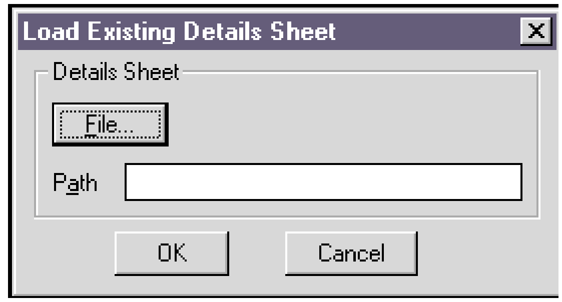

Figure 9. Existing details sheet file search

CADD Detail Manager Setup

As shown in Figure 7, the user first has to set the units of the drawing—either inch-pound or metric. The user then has the option of selecting an existing border sheet file, one of the metric border sheets included on the CADD Details Manager CD, or no border sheet at all. If an existing border sheet is chosen, that sheet has to have been drawn full size (e.g., an ANSI D size border sheet has to measure 22 in. by 34 in.). Once all desired settings have been chosen, click the "OK" button, which will start the CADD Detail Manager.

Note: In MicroStation, if inch-pound units are chosen, the working units are reset to 1:12:8000 and for metric units, the working units are reset to 1:1:10 (Figure 10). These working units conform to those mandated in Release 1.8 of the Tri-Service A/E/C CADD Standard.

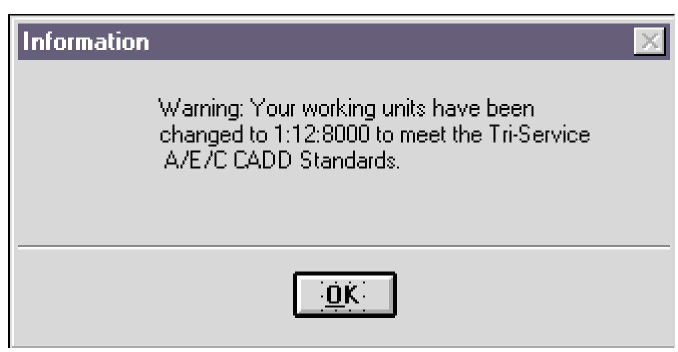

Figure 10. Working units warning box

CADD Detail Manager Use

Within the CADD Detail Manager (Figure 11), details are cataloged first by discipline (i.e., Architectural, Electrical, Mechanical, etc.). Once a discipline is chosen, the user then can select from different UniFormat Level 2 Categories and Detail Codes until a list of details within those selections appears. Each line within the resulting list of details gives three pieces of information: the name of the detail, the detail description, and the insertion scale for that detail. Clicking on a particular detail causes an image of that detail to appear in the Preview box.

Before a desired detail can be inserted, the correct insertion scale for that detail needs to be set (as mentioned previously, the insertion scale is listed along with the detail name and description in the Available Details list box). To set the insertion scale, click the “Scale” button. The user will then be taken to a scale conversion dialog box (Figure 12). From this box, the scale matching that noted in the detail description should be chosen (Note: the user must select a scale, otherwise the detail will not insert at the proper size). Once the correct scale is chosen, the user will be taken back to the CADD Detail Manager screen (Figure 11), where the “Insert” option should be chosen. The user will then be allowed to drag the detail to the desired position and insert it into the drawing. This detail should then be edited/modified to meet site-specific requirements. Similarly, more details can be inserted into the existing drawing until a complete sheet of details is created.

Other Installation Options

As delivered, the setup routines included with the CADD Details Library CD install configuration files that point to the CD-ROM drive as the location for certain files. It is possible that a site may want these files shared over a server. In order to locate the details files, the installed configuration files need to be edited to point to the new location. In AutoCAD, this file is called cdm_set.dfs and is saved to the AutoCAD “Support” directory. In MicroStation, this

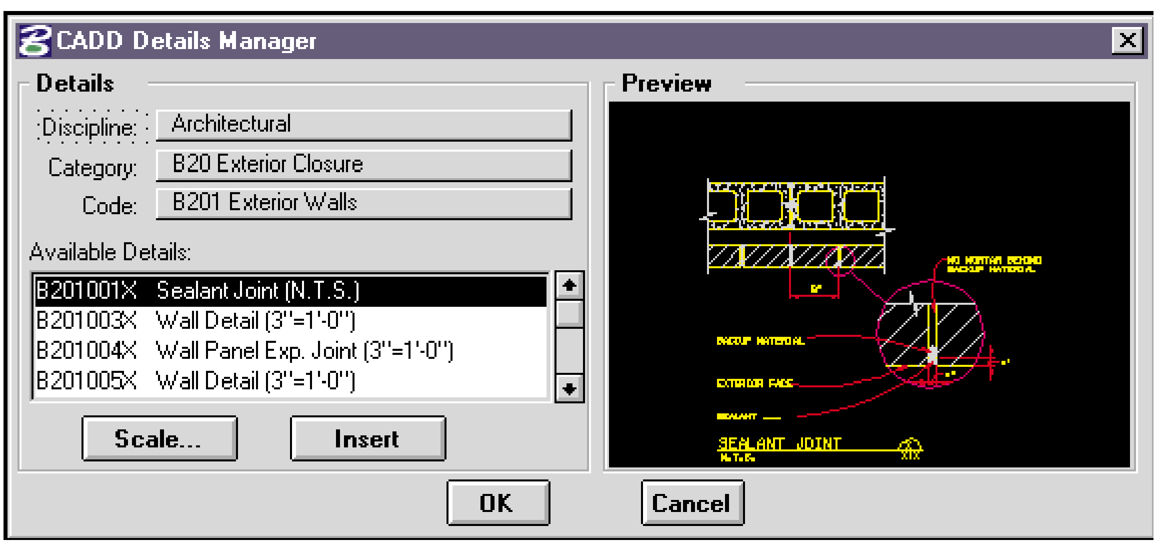

Figure 11. CADD Detail Manager

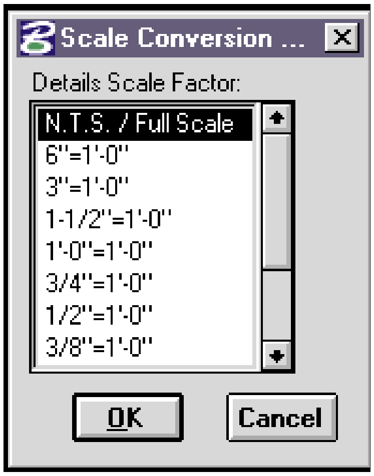

Figure 12. Scale conversion

file is called ustncfg.dos and is stored in a new directory called "Details" under the MicroStation directory. Both configuration files contains directory paths similar to the following (in this case, the CD-ROM drive was E:):

E:\DETAILS\SHEETS\ANSID.DGN

C:\win32app\USTN95\DETAILS\SETUP.UNI

E:\DETAILS\INDEX\

E:\DETAILS\USTN\

If the files contained within the directory "Details" on the CD are copied to a server or another location, then the path to those files needs to be changed appropriately.

4 Design/Construction Field Working Group

The Design/Construction Field Working Group (FWG) is composed of architects, interior designers, and engineers from various design agencies within the Army, Navy, Air Force, and Corps of Engineers. The Design/Construction FWG's primary function is to serve as a leader in the improved usage of CADD technology as it relates to the design disciplines. The group reviews and reports on the status of CADD within the tri-services, recommends and/or prepares standards, and implements productivity enhancements within DoD.

Table 5 lists current Design/Construction FWG members.

Table 5
Design/Construction Field Working Group

Member	Site	Service
Brenda Langheld	Brooks AFB	Air Force
James Roesch	Grand Forks AFB	Air Force
Larry Strother	Tyndall AFB	Air Force
Sharrol Toenjes	Scott AFB	Air Force
David Gutierrez	Fort Sam Houston	Army
Mike Luhrman	Fort Sam Houston	Army
Alex Shum	Fort Sam Houston	Army
Robert Weaver	Fort Carson	Army
Richard Allwes	Pittsburgh District	Corps
Lisa Edwards	Huntington District	Corps
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Stan Shirk	Omaha District	Corps
Marsha Walkup	Kansas City District	Corps
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James Gale	Atlantic Division	Navy
Edward Ruckle	Southwest Division	Navy

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Note: “*” = .dgn/.dwg

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6 Inch-Pound Library

The following pages contain images of the CADD Details Library. The details presented are accessible through the Center-supplied retrieval programs. Loading instructions are provided as part of the electronic media. Appendix C contains a form for recommending changes to specific details within the CADD Details Library.

Note: Because these details represent existing details used within the DoD, it should be noted that the level/layer assignments, colors, and line weights for some details do not meet the prescribed standards set forth in this manual. Subsequent versions of the CADD Details Library will continue to convert details to meet the prescribed standards.

Appendix A
Abbreviations for CADD Details Library

Abbreviation	Definition
(N)	new
(R)	relocated item
<	angle
1/4 RD	quarter round
A/C	air conditioning
A.C.	alternating current
A.L.	active leaf
AB	anchor bolt
ABV	above
ACC	access
ACI	American Concrete Institute
ACPL	acoustical plaster
ACR	acrylic plastic
ACSR	aluminum conductor steel reinforced
ACST	acoustic
ACU	air conditioning unit
AD	access door
ADD	addendum
ADH	adhesive
ADJ	adjacent, adjunct
ADJT	adjustable
ADO	automatic door operator
AFF	above finished floor
AGG	aggregate
AHU	air handling unit
AI	area inlet
AIC	amps interrupting capacity (sym rms)
AISC	American Institute of Steel Construction
ALT	alternate
ALUM	aluminum

Abbreviation	Definition
AMB	ambient
AMP	ampere
ANC	anchor, anchorage
ANOD	anodized
ANSI	American National Standards Institute
AP	access panel
APPD	approved
APPROX	approximate
ARCH	architect(ural)
ARI	American Refrigeration Institute
ASB	asbestos
ASC	above suspended ceiling
ASPH	asphalt
AT, ACT	acoustical (ceiling) tile
ATC	acoustical tile ceiling
AUTO	automatic
AVG	average
AWC	acoustical wall covering
AWG	American wire gauge
B	bins
B.M.	bench mark
BATT INSUL	batt insulation
BBD	bulletin board
BC	bookcase
BD	board
BDY	boundary
BE	bench
BEJ	brick expansion joint
BEL	below
BIT	bituminous

Abbreviation	Definition
BJT	bed joint
BL	building line
BLDG	building
BLK	block
BLKG	blocking
BM	beam
BO	bottom of
BOT	bottom
BP	back plaster(ed)
BPL	bearing plate
BPR	bed pan and urinal rack
BRCG	bracing
BRDG	bridging
BRG	bearing
BRK	brick
BRKT	bracket
BRZ	bronze
BS	both sides
BSMT	basement
BT	bent
BTU	British thermal unit
BTUH	btu per hour
BTW	between
BUR	built-up roofing
BVL	beveled
BW	both ways
C to C	center to center
C.B.	circuit breaker
C.I.	curb inlet
C.T.	current transformer
CAB	cabinet
CAD	cadmium
CAP	capacity
CB	catch basin
CCT	cubicle curtain track
CCU	coronary care unit
CE	cover elevation
CEM	cement
CER	ceramic
CFI	conductive flooring
CFL	counterflashing
CFM	cubic feet per minute
CFT	cubic foot
CG	corner guard

Abbreviation	Definition
CHAM	chamfer
CHBD	chalkboard
CHIM	chimney
CHT	ceiling height
CI	cast iron
CIPC	cast-in-place concrete
CIR	circular
CIRC	circumference
CJT	control joint
CKD	checked
CKT	circuit
CL WG	clear wire glass
CL	center line
CLG	ceiling
CLGL	clear glass
CLKG	caulking
CLL	contract limit line
CLO	closet
CLOS	closed
CLR	clear(ance)
CLS	closure
CM	centimeter(s)
CMP	corrugated metal pipe
CMT	ceramic mosaic (tile)
CMU	concrete masonry unit
CND	conduit (for raceway-elec. sheets)
CNL	conductive neoprene latex
CNTR	counter
CO	cleanout
CO2	carbon dioxide
COL	column
COM	common
COMB	combustion
COMP	compress(ed)(ion)(ible)
COMPO	composite, composition
COMPT	compartment
CONC	concrete
CONN	connection
CONST	construction
CONST JT	construction joint
CONT	continue (ous)
CONTR	contract(or)
COR	corner

Abbreviation	Definition
CORR	corrugated
CORR.	corridor
COV	covered
CP, CPT	carpet(ed)
CPL	cement plaster
CPR	copper
CPS	cycles per second (hertz)
CR	chromium (plated)
CRES	corrosive resistant steel
CRG	cross grain
CRS	course(s)
CSK	countersink, countersunk
CSMT	casement
CST	cast stone
CT	ceramic tile
CTL	carpet tile
CTP	ceramic tile panel
CTR	center
CTSK	countersunk screw
CU	condensing unit
CU YD	cubic yards
CUH	cabinet unit heater
CV	ceiling vent
CVH	conductive vinyl homogeneous (sheet type)
CW	cold water
CYL	cylinder
d	penny (as in nail - 10d)
D	datum
D.H.	double hung
D&M	dressed and matched
DA	double acting
DB	dry bulb
DBL	double
DC	dental casework
DCJ	doweled control joint
DCJT	dummy control joint
DCL	door closer
DEG	degree
DEM	demolish
DEP	depressed
DEPR	depression
DEPT	department
DF	drinking fountain

Abbreviation	Definition
DH	duct heater
DIA	diameter
DIAG	diagonal
DIM	dimension
DISC	disconnect
DISP	dispenser
DIST	distribution
DIV	division
DL	dead load
DMT	demountable
DN	down
DP	dampproofing
DPR	damper
DR	door
DRB	drainboard
DRN	drain
DS	downspout
DSB	double strength “b” quality glass
DT	drain tile
DTA	dovetail anchor
DTL, DET	detail
DTS	dovetail anchor slot
DW	dumbwaiter
DWG	drawing
DWGS	drawings
DWLS	dowels
DWR	drawer
DX	direct expansion
E	east
E.P.	electric panelboard
EA	exhaust air
EA.	each
EAT	entering air temperature
EB	expansion bolt
EEG	electro encephalographic
EF	each face
EJ	expansion joint
EKG	electrocardiograph
EL, ELEV	elevation - grade or building
ELEC	electric or electrical
EMD	estimated maximum demand
EMER	emergency
ENCL	enclose(ure)

Abbreviation	Definition	Abbreviation	Definition
ENT	ear, nose, and throat	FH	flathead or flushhead
ENTR	entrance, entering	FHC	fire hose cabinet
EP	explosion proof	FHMS	flathead machine screw
EPY	epoxy coating	FHR	fire hose rack
EQ	equal	FHS	fire hose station
EQUIP	equipment	FHWS	flathead wood screw
ESC	escalator	FI	film illuminator
EST	estimate(d)	FIG	figure
EWC	electric water cooler	FIN	finish(ed)
EWT	entering water temperature	FIX	fixture
EXCA	excavate	FJT	flush joint
EXD	exit device	FL	floor
EXH	exhaust	FLASH	flashing
EXIST	existing	FLCO	floor cleanout
EXMP	expanded metal plate	FLEX	flexible
EXP	exposed, expansion	FLG	flooring
EXPL	explosion	FLR	floor
EXPN	expansion	FLUOR	fluorescent
EXS	extra strong	FN	fence
EXT	exterior	FOC	face of concrete
F	Fahrenheit	FOF	face of finish
F.D.	fire damper	FOM	face of masonry
F.H.	fire hydrant	FOS	face of studs
FA	fire alarm	FP	fire partition
FAC	fire apparatus closet	FPL	floor plate
FAI	fresh air intake	FPM	feet per minute
FAS	fasten(er)	FPRF	fireproof
FB	face brick	FR	frame(d)(ing)
FBD	fiberboard	FRA	fresh air
FBO	furnished by others	FRC	fire-resistant coating
FBRK	fire brick	FRG	forged
FC	foot-candle	FRT	fire-retardant
FCG	facing	FS	full size
FCJ	floor construction joint	FT	feet
FCU	fan coil unit	FTG	footing
FD	floor drain	FUR	furr(ed)(ing)
FDN	foundation	FUT	future
FE	fire extinguisher	FW	fire water
FEB	fire extinguisher bracket	FWC	fabric wall covering
FEC	fire extinguisher cabinet	G	gas
FF	factory finish	GA	gage or gauge
FFE	finished floor elevation	GAL	gallon(s)
FFL	finished floor line	GALV	galvanized
FGL, F.G.	fiberglass	GB	grab bar

Abbreviation	Definition
GC	general contract(or)
GCMU	glazed concrete masonry units
GCO	ground cleanout
GEN	general
GF	ground face
GFE	government-furnished equipment
GFE/CI	government-furnished equipment contractor installed
GFI	ground fault interrupter
GI	galvanized iron
GKT	gasket(ed)
GL	glass, glazing
GLB	glass block
GLF	glass fiber
GND	ground
GOVT	government
GP	galvanized pipe
GPDW	gypsum drywall
GPL	gypsum lath
GPM	gallons per minute
GPPL	gypsum plaster, finish floor
GPT	gypsum tile
GR	grade(ing)
GRN	granite
GRS	galvanized rigid steel conduit
GRTG	grating
GSS	galvanized steel sheet
GST	glazed structural tile
GSU	glazed structural units
GT	grout
GVL	gravel
GWB	gypsum wallboard
GWT	glazed wall tile
GYP	gypsum
H.D.	heavy duty
H.M.	hollow metal
H’CAP	handicapped
HAC	housekeeping aide’s closet
HB	hose bibb
HBD	hardboard
HC	hollow core
HCD	halon containment damper
HD	head
HDR	header
HDRL	handrail
HDW	hardware
HES	high early-strength cement
HH	handhole
HIP	high pressure
HJT	head joint
HK	hook(s)
HOR	horizontal
HP	horsepower
HPT	high point
HR	hour
HS	high strength
HSGYP	high-strength gypsum plaster
HT	height
HTG	heating
HTR	heater
HVAC	heating, ventilating and air conditioning
HWD	hardwood
HWH	hot water heater
HX	hexagonal
HYD	hydraulic
HZ	hertz
I	iron
I.D.	inside diameter
IC	intercom
ICU	intensive care unit
IES	illuminating engineering society
ILK	interlock
IN	inch
INCIN	incinerator
INCL	include(d)(ing)
INSC	insulating concrete
INSF	insulating fill
INSUL	insulation
INSUL’D	insulated
INT	interior
INTM	intermediate
INV	invert(ed)
IP	iron pipe
IPS	iron pipe size
I.P.S.	inside pipe size

Abbreviation	Definition
IV	intravenous
JB	junction box
JC	janitor’s closet
JCT	junction
JF	joint filler
JST	joist
JT	joint
KCM	kilo circular mil
KCPL	Keene’s cement plaster
KIP	kilopound (1000 pounds)
KIT	kitchen
KL	key lock
KO	knockout
KPL	kickplate
KV	kilovolts
KVA	kilovolt amperes
KVAR	kilovolt amperes reactive
KW	kilowatt
L	lumen
L.H.	left hand(ed)
LAB	laboratory
LAD	ladder
LAM	laminate(d)
LAT	leaving air temperature
LAU	laundry
LAV	lavatory
LB	lag bolt
LBL	label
LBR	lumber
LBS	pounds
LC	light control
LD	load
LDG	loading
LG	length
LIN	linear
LIS	lawn irrigation system
LKR	locker
LL	live load
LLD	lead-lined door
LMS	limestone
LNTL	lintel
LONG	longitudinal
LP	lightproof
LPD	lightproof door
LPS	lightproof shade
LPT	low point
LR	living room
LT WT	lightweight
LT	light
LTG	lighting
LVR	louver
LWC	lightweight concrete
LWT	leaving water temperature
M	meter(s)
M&B	matched and beaded
MACH	machine
MAS	masonry
MAX	maximum
MB	machine bolts
MBR	member
MCJ	masonry control joint
MCO	metal-cased opening
MDS	metal divider strip
MECH	mechanic(al)
MED	medium
MEDCAB	medical cabinet
MER	mechanical equipment room
MES	metal edge strip
MET	metal
MFD	metal floor decking
MFG	manufacturing
MFR	manufacture(er)
MGT	matte-glazed tile
MG	motor generator
MH	manhole
MI	malleable iron
MIN	minimum
MIR	mirror
MISC	miscellaneous
ML	metal lath
MLDG	moulding
MM	millimeter(s)
MMB	membrane
MNIC	material not in contract (installation by contractor)
MO	masonry opening
MOD	modular
MOD.	modified

Abbreviation	Definition	Abbreviation	Definition
MONO	monolithic	OHMS	ovalhead machine screw
MOT	motor	OHWS	ovalhead wood screw
MOV	movable	OJ	open-web joist
MP	movable partition	OP	opaque
MR	mop receptor	OPH	opposite hand
MRB	marble	OPNG	opening
MRD	metal roof decking	OPP	opposite
MS	machine screws	OPS	operations
MSTC	mastic	OR	observation riser
MTD	mount(ed)(ing)	OS & Y	outside screw and yoke
MTFR	metal furring	OT	occupational therapy
MTHR	metal threshold	OW	observation window
MTL	material(s)	P	pole
MULL	mullion	P.L.	property line
MWK	millwork	P.S.	pressed steel
N	north	PA	public address
N.C.	normally closed	PAR	parallel
N.L.	neoprene latex	PART'N(S)	partition(s)
N.O.	normally open	PB	panic bar
N'REQD	not required	PBD	particle board
NAT	natural	PBPU	patient's bedside power unit
NEC	national electrical code	PBS	push button station
NEMA	National Electrical Manufacturer's Association	PC	piece
		PCC	precast concrete
NFPA	National Fire Protection Association	PCF	pounds per cubic foot
NI	nickel	PCPL	cement plaster (portland)
NIC	not in contract	PD	pavement drain
NL	nailable	PE	porcelain enamel
NMT	nonmetallic	PED	pedestal
NO.	number	PERF	perforate(d)
NOM	nominal	PERI	perimeter
NP	neuropsychiatric	PFL	pounds per lineal foot
NR	noise reduction	PG	plate glass
NRC	noise reduction coefficient	PH	phase
N.T.S.	not to scale	PHAR	pharmacy
O.D.	outside diameter	PI	point of intersection
OA	outside air	PIPU	prefab isolation power unit
OB WG	obscure wire glass	PIV	post indicating valve
OBGL	obscure glass	PK	parking
OBSC	obscure	PL	plate
OC	on center(s)	PLAS	plaster
OCEW	on center each way	PLAS LAM	plastic laminate
OFF	office	PLATF	platform
OH	overhead	PLBG	plumbing

Abbreviation	Definition
PLG	piling
PLYWD	plywood
PNL	panel
PNT	paint(ed)
POL	polish
PORC	porcelain
PORT	portable
PPG	polished plate glass
PPM	parts per million
PR	pair
PREFAB	prefabricate(d)
PREFIN	prefinished
PRF	preformed
PROJ	project
PRV	pressure-regulating valve
PS	pipe space
PSC	prestressed concrete
PSF	pounds per square foot
PSI	pounds per square inch
PT	pneumatic tube
PT.	point
PTC	post-tensioned concrete
PTD	paper towel dispenser
PTR	paper towel receptor
PV	pave(d)(ing)
PVC	polyvinylchloride
PVMT	pavement
PW	pass window
QT	quarry tile
QT.	quart
QTRS	quarters
QTY	quantity
R.D.	roof drain
R.H.	right hand(ed)
R&S	casework in clergy room and sacristy, chaplain service
RA	return air
RAD	radius
RAG	return air grille
RAR	return air register
RB	rubber base, resilient base
RBL	rubble stone
RBT	rabbet, rebate
RC	remote control

Abbreviation	Definition
RCP	reinforced concrete pipe
RCVR	receiver
RDGE	ridge
RECEP	receptacle
RECR	recreation
RECT	rectifier
REF	reference
REFR	refrigerator
REG	reglet
REG.	register
REINF	reinforcing, reinforced, reinforcement
REM	remove(able)
REQ’D, REQD	required
RESIL	resilient
RET	return
REV	revision(s), revised
RFG	roofing
RFH	roof hatch
RFL	reflect(ed)(ive)(or)
RGE	range
RGH	rough
RH	relative humidity
RK	rack
RL	rail(ing)
RM	room
RND	round
RO	rough opening
ROW	right of way
RP	retractable partition
RPM	revolutions per minute
RPRT	raised pattern rubber tile
RSR	riser
RT	rubber tile
RUB	rubber
RVS	reverse (side)
RVT	rivet
RWC	rainwater conductor
S	south
S.B.	security bars
S.C.	special coating
S&R	shelf and rod
SA	supply air
SB	splash block

Abbreviation	Definition	Abbreviation	Definition
SC	solid core	STD	standard
SCHED	schedule	STG	seating
SCI	spinal cord injury	STGR	stringer
SCN	screen	STL	steel
SCR	screw	STN	stone
SCT	structural clay tile	STOR	storage
SCUT	scuttle	STRL	structural
SD	storm drain	STWY	stairway
SDI	Steel Door Institute	SUB FL	subfloor
SECT	section	SUSP	suspended
SECY	secretary	SVF	sheet vinyl flooring
SEQ	sequence	SW	switch
SFGL	safety glass	SWBD	switchboard
SFTU	structural facing tile unit	SYM	symmetrical
SFU	structural facing unit	SYN	synthetic
SG	sheet glass	SYS	system
SH	shelf, shelving	T	tread
SHLD	shoulder	T'STAT	thermostat
SHO	shore(d)(ing)	T&G	tongue and groove
SHT	sheet	TA	table
SHTG	sheathing	TAN	tangent
SIM	similar	TB	towel bar
SJI	Steel Joist Institute	TC	terra cotta
SKL	skylight	TEL	telephone
SL	sleeve	TEMP	temperature
SM	sheet metal	TEMP.	temporary
SMS	sheet metal screws	TERM	terminal
SNT	sealant	TERR	terrazzo
SOV	shut off valve	TGL	toggle
SP	static pressure	TH	truss head
SPC	spacer	THK	thick(ness)
SPD	soundproof door	THR	threshold
SPEC(S)	specification(s)	TKBD	tackboard
SPF	soundproof	TKS	tackstrip
SPH	space heater	TO	top of
SPKR	speaker	TOIL	toilet
SPL	special	TOL	tolerance
SQ	square	TOPO	topography
SQHD	square head	TPD	toilet paper dispenser
SQUAD	squadron	TPTN	toilet partition
SS, SST	stainless steel	TR	transom
SSK	service sink	TRANS	transverse
SSMR	standing seam metal roofing	TSL	top of slab
STA	station	TST	top of steel

Abbreviation	Definition
TT	terrazzo tile resinous matrix
TV	television
TW	top of wall
TYP	typical
UC	unit cooler
UG	underground
UH	unit heater
UL	Underwriters Laboratories
UNEX	unexcavated
UNFIN	unfinished
UPS	uninterruptable power system
UR	urinal
UT	utility
UV	unit ventilator
V	volt
V.T.	voltage transformer
VA	vinyl asbestos
VAB	vapor barrier
VAR	varnish
VAT	vinyl asbestos tile
VB	vinyl base
VCP	vitrified clay pipe
VCT	vinyl composition tile
VD	vault door
VENT	ventilator(tion)
VERT	vertical
VEST	vestibule
VF	vinyl fabric
VG	vertical grain
VH	vinyl homogeneous
VIN	vinyl
VJ	v-joint(ed)
VL	clinical laboratory equipment
VNR	veneer
VOL	volume
VR	radio isotope lab equipment
VRM	vermiculite
VS	vent stack
VT	vinyl tile

Abbreviation	Definition
VTR	vent thru roof
VWC	vinyl wall covering
W	west
W/	with
W/O	without
W/C	wheelchair
W.D.	waste drain
W.S.	waste stack
WB	wet bulb
WC	water closet
WCO	wood-cased opening
WD BLK	wood blocking
WD	wood
WD DR	wood door
WF	wire flange
WG	wire glass
WH	wall hung
WHB	wheel bumper
WHM	watthour meter
WHT	white
WI	wrought iron
WIN	window
WKSH	work shop
WM	wire mesh
WP	weatherproof
WPF, WPFG	water proof(ing)
WPT	working point
WR	waste receptacle
WRB	wardrobe
WS	waterstop
WSCT	wainscot
WT	weight
WTH	width
WTW	wall to wall
WWF	welded wire fabric
WWM	woven wire mesh
X	X-ray equipment radiology
XFMR	transformer
Y.D.	yard drain
YD	yard

Appendix B
Metric Construction Information

The following information was originally published in the Construction Metrication Council's *Metric in Construction* newsletter, Volume 3, Issue 3, dated May-June 1994. *Metric in Construction* is a bimonthly newsletter designed to inform the building community about metrication in U.S. construction. The Construction Metrication Council was created by the National Institute of Building Sciences to provide industry-wide, public, and private sector support for the metrication of Federal construction and to promote the adoption and use of the metric system of measurement as a means of increasing the international competitiveness, productivity, and quality of the U.S. construction industry. The current Chairman of the Council is Mr. Thomas R. Rutherford, P.E., DoD, and the Executive Director is Mr. William A. Brenner, AIA. The Center would like to thank Mr. Brenner for allowing the reprint of the Council's newsletter information. For information on how to subscribe to *Metric in Construction*, please address all inquiries to the following:

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ONE MORE TIME: WHAT WILL CHANGE AND WHAT WILL STAY THE SAME?

METRIC MODULE AND GRID

What will change

- The basic building module, from 4 inches to **100 mm**.
- The planning grid, from 2' x 2' to **600 x 600 mm**.

What will stay the same

- A module and grid based on rounded, easy-to-use dimensions.

DRAWINGS

What will change

- Units, from feet and inches to millimeters for all building dimensions and to meters for large site plans and civil engineering drawings. Unit notations are unnecessary: if there's no decimal point, it's millimeters; if there's a decimal point carried to one, two, or three places, it's meters. Centimeters are not used in construction.

- Drawing scales, from inch-fractions-to-feet to true ratios. Preferred metric scales are **1:1** (full size); **1:5** (close to 3" = 1'-0"); **1:10** (between 1" = 1'-0" and 1-1/2" = 1'-0"); **1:20** (between 1/2" = 1'-0" and 3/4" = 1'-0"); **1:50** (close to 1/4" = 1'-0"); **1:100** (close to 1/8" = 1'-0"); **1:200** (close to 1/16" = 1'-0"); **1:500** (close to 1" = 40'-0"); **1:1000** (close to 1" = 80'-0").

- Drawing sizes, to the ISO "A" series: **AO** (**1189 x 841 mm**, 46.8 x 33.1 inches); **A1** (**841 x 594 mm**, 33.1 x 23.4 inches); **A2** (**594 x 420 mm**, 23.4 x 16.5 inches); **A3** (**420 x 297 mm**, 16.5 x 11.7 inches); **A4** (**297 x 210 mm**, 11.7 x 8.3 inches). Of course, metric drawings can be made on any size paper.

What will stay the same

- Drawing contents.

Never use dual units (both inch-pound and metric) on drawings. It increases dimensioning time, doubles the chance for errors, makes drawings more confusing, and delays the learning process.

SPECIFICATIONS

What will change

- Units of measure, from feet and inches to **millimeters** for linear dimensions, from square feet to **square meters** for area, from cubic yards to **cubic meters** for volume (except use **liters** for fluid volumes), and from other inch-pound units to metric units as appropriate.

What will stay the same

- Everything else in the specification.

Do not use dual units in specifications except when the use of an inch-pound measure serves to clarify an otherwise unfamiliar metric measure; then place the inch-pound unit in parentheses after the metric. For example, "7460 W (10 horsepower)." All unit conversions should be **checked by a professional** to ensure that rounding does not exceed allowable tolerances.

FLOOR LOADS

What will change

- Floor load designations, from "psf" to kilograms per square meter (**kg/m²**) for everyday use and kilonewtons per square meter (**kN/m^2**) for structural calculations.

What will stay the same

- Floor load requirements.

Kilograms per square meter often are used to designate floor loads because many live and dead loads (furniture, filing cabinets, construction materials, etc.) are measured in kilograms. However, kilonewtons per square meter or their equivalent, megapascals, are the proper measure and should be used in structural calculations.

CONSTRUCTION PRODUCTS

What will change

- Modular products: brick, block, drywall, plywood, suspended ceiling components, and raised floors. They will undergo "hard" conversion; that is, their dimensions will change to new rounded "hard" metric numbers to fit the universal **600 x 600 mm** metric planning grid.

- A number of other products, such as concrete reinforcing bars and various kinds of fasteners. They are being converted to hard metric sizes as the result of industry initiatives.

- Products that are custom fabricated for each job (for example, cabinets, stairs, handrails, ductwork, commercial doors and windows, structural steel, and precast concrete) or poured-in-place (concrete). Such products usually can be made to any size, inch-pound or metric, with equal ease so for metric jobs they simply will be fabricated or formed in metric.

What will stay the same

- The balance of products, since they are cut-to-fit at the jobsite (for example, framing lumber, woodwork, wiring, piping, and roofing) or are not dimensionally sensitive (for example, fasteners, hardware, electrical components, plumbing fixtures, HVAC equip ment, and gravel). Such products will be just “soft” converted—that is, relabeled in metric. A 2-3/4" x 4-1/2" wall switch face plate will be relabeled 70 x 115 mm and a 30 gallon tank, 114 L. Eventually manufacturers may convert many of these products to new rounded “hard” metric sizes, but only when it becomes convenient to do so.

“2-BY-4" STUDS AND OTHER ”2-BY" FRAMING (BOTH WOOD AND METAL)

What will change

- Spacing, from 16" to **400 mm**, and 24" to **600 mm**.

What will stay the same

- Cross sections.

“2-bys” are produced in fractional inch dimensions now so there is no need to convert them to new rounded “hard” metric dimensions. 2-by-4s may keep their traditional name or perhaps they’ll be relabeled a nominal 50 x 100 mm or a more exact size, such as 38 x 89 mm.

DRYWALL, PLYWOOD, AND OTHER SHEET GOODS

What will change

- Widths, from 4’-0" to **1200 mm**.
- Heights, from 8’-0" to **2400 mm**, 10’-0" to **3000 mm**.

What will stay the same

- Thicknesses, so fire, acoustic, and thermal ratings won’t have to be recalculated.

Metric drywall and plywood are readily available, but with a possible cost penalty for small orders. Metric rigid insulation may not be available at this time.

BATT INSULATION

What will change

- Nominal width labels, from 16" to **16"/400** mm and 25" to **24"/600 mm**.

What will stay the same

- Everything else.

Batts will not change in width; they’ll just have a tighter “friction fit” when installed among metric-spaced framing members.

DOORS

What will change

- Height, from 6'-8" to **2050 mm** or **2100 mm** and from 7'-0" to **2100 mm**.
- Width, from 2'-6" to **750 mm**, from 2'-8" to **800 mm**, from 2'-10' to **850 mm**, from 3'-0" to **900 mm** or **950 mm**, and from 3'-4" to **1000 mm**.

What will stay the same

- Door thicknesses.
- Door materials and hardware.

For commercial work, doors can be ordered in any size since they normally are custom-fabricated.

CEILING SYSTEMS

What will change

- Grids and lay-in ceiling tile, air diffusers, and lighting fixtures— from 2' x 2' to **600 x 600 mm** and from 2' x 4' to **600 x 1200 mm**.

What will stay the same

- Grid profiles, tile thicknesses, air diffuser capacities, florescent tubes, and means of suspension.

RAISED FLOOR SYSTEMS

What will change

- Grids and lay-in floor tile, from 2' x 2' to **600 x 600 mm**.

What will stay the same

- Grid profiles, tile thicknesses, and means of support.

HVAC CONTROLS

What will change

- Temperature units, from Fahrenheit to Celsius.

What will stay the same

- All other parts of the controls.

Controls are now digital so temperature conversions can be made with no difficulty.

BRICK

What will change

- Standard brick to **90 x 57 x 190 mm.**
- Mortar joints from 3/8" and 1/2" to **10 mm**.
- Brick module from 2' x 2' to **600 x 600 mm**.

What will stay the same

- Brick and mortar composition.

Of the 100 or so brick sizes currently made, 5 to 10 are within a millimeter of a metric brick so the brick industry will have no trouble supplying metric brick.

CONCRETE BLOCK

What will change

- Block sizes to **190 x 190 x 390 mm**.

- Mortar joints from 1/2" to **10 mm**.

- Block module from 2’ x 2’ to **600 x 600 mm**.

What will stay the same

- Block and mortar composition.

SHEET METAL

What will change

- Designation from “gage” to millimeters.

What will stay the same

- Thickness, which will be soft converted to hundredths of a millimeter.

In specifications, use millimeters only or millimeters with the gage in parentheses.

CONCRETE

What will change

- Strength designations from “psi” to megapascals, rounded to the nearest 5 megapascals per ACI 318M, such as: 2500 psi to **20 Mpa**; 3000 psi to **25 MPa**; 3500 psi to **25 Mpa**; 4000 psi to **30 Mpa**; 4500 psi to **35 Mpa**; 5000 psi to **35 Mpa**. The amount of rounding will depend upon the use of the concrete.

What will stay the same

- Everything else.

REBAR [revised 10/95]

What will change

- Rebars will probably remain the same size but be given new metric designations as follows: #3 to #10M, #4 to #13M, #5 to #16M, #6 to #19M, #7 to #22M, #8 to #25M, #9 to #29M, #10 to #32M, #11 to #36M, #14 to #45M, and #18 to #57M. Call the Concrete Reinforcing Steel Institute for details: 708-517-1200.

What will stay the same

- Concrete.

GLASS

What will change

- Cut sheet dimensions from feet and inches to millimeters.

What will stay the same

- Sheet thickness, which can be rolled to any dimension and is often rolled in millimeters now. See ASTM C1036.

PIPE

What will change

- Nominal pipe and tubing designations from inches to millimeters.

What will stay the same

- Pipe cross sections.

Pipes and fittings are produced in decimal inch dimensions but named in rounded inch dimensions as a matter of convenience. A 2-inch pipe has neither an inside nor an outside diameter of 2 inches, a 1-inch fitting has no exact 1-inch dimension, and a 1/2-inch sprinkler head contains no 1/2-inch dimension anywhere, so there is no need to “hard” convert pipes and fittings to rounded metric dimensions. Instead, they will not change size but simply be renamed in metric as follows: 1/8" = **6 mm**; 3/16" = **7 mm**; 1/4" = **8 mm**; 3/8" = **10 mm**; 1/2" = **15 mm**; 5/8"= **18 mm**; 3/4" = **20 mm**; 1" = **25 mm**; 1-1/4" = **32 mm**; 1-1/2"`= **40 mm**; 2" = **50 mm**; 2-1/2" = 65 mm; 3" = 80 mm; 3-1/2" = **90 mm**; 4" = **100 mm**; 4-1/2" = **115 mm**; and 1" = 25 mm for all larger sizes. See the July-August 1993 *Metric in Construction* newsletter for more information.

ELECTRICAL CONDUIT

What will change

- Nominal conduit designations from inches to millimeters.

What will stay the same

- Conduit cross sections.

Electrical conduit is similar to piping: it is produced in “soft” decimal inch dimensions but identified in nominal inch sizes. Neither nonmetallic nor metallic conduit will change size; they be relabeled in metric as follows: 1/2" = **16** (mm), 3/4" = **21**; 1" = **27**; 1-1/4" = **35**; 1-1/2" = **41**; 2" = **53**; 2-1/2" = **63**; 3" = **78**; 3-1/2" = **91**; 4" = **103**; 5" = **129**; 6" = **155**. These new metric names have been assigned by the National Electrical Manufacturers Association.

ELECTRICAL WIRE

What will change

- Nothing at this time.

What will stay the same

- Existing American Wire Gage (AWG) sizes.

STRUCTURAL STEEL

What will change

- Section designations, from inches to millimeters and from pounds per foot to kilograms per meter, in accordance with ASTM A6M.

- Bolts, to metric diameters and threads per ASTM A325M and A490M.

What will stay the same

- Cross sections.

Like pipe and conduit, steel sections are produced in decimal inch dimensions (with depths varying by weight) but are named in rounded inch dimensions. Metric names for equivalent sections are converted and rounded to the nearest 10 mm. Thus, a 10-inch section is relabeled as a 250 mm section and a 24-inch section is relabeled as a 610 mm section.

Appendix C Detail Revision/Deletion Recommendation Form

Name: ____

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Reason: ____

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13. ABSTRACT ***(Maximum 200 words)***

Several years ago, before computer-aided design and drafting (CADD) became the standard drafting tool in design, a seasoned draftsman might require, on the average, 40 hr to develop a sheet of construction details. By using CADD, this effort has easily been reduced to less than 15 hr. By employing the proposed CADD Details Library, an entire sheet of 20 details can be constructed in less than 10 min and, in many cases, require only minor project-specific modifications. By any measure, the development and reuse of CADD details represent a considerable time-saving tool.

It is important to realize that the CADD Details Library was developed by collecting existing details within the Department of Defense (DoD). The former Architectural Automation Task Group (AATG), now renamed the Architectural Automation Field Working Group (AAFWG), did not expend design funds to hire an architect/engineer or use in-house resources to develop completely new details. The AATG membership simply organized existing details into a generic format and cataloged them by type.

(Continued)

14. SUBJECT TERMS

CADD	Details
CADD Details	HTRW Details
Construction Details	

15. NUMBER OF PAGES
110

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED		

To further simplify the use of the details library, the AAFWG tasked the Tri-Service CADD/GIS Technology Center (the Center) to develop an icon-driven software retrieval system. Developed with MDL and AutoLISP programming, the retrieval software will work on UNIX and DOS Intergraph platforms and AutoCAD DOS systems.

Typically, detailing on a design project does not begin prior to the 35-percent design phase. At the 35-percent phase, the designer has defined the building's structure and envelope requirements and is ready to begin selecting typical project details.

After reviewing the generic details in hardcopy format and identifying usable details, the designer/draftsman initiates the CADD Detail Manager program. The designer scrolls through the details listing, identifies the desired detail, reviews it within the display icon, and then places it on the details sheet. The retrieval program provides a rectangular box (representing the detail's dimensions) that may be dragged within the drawing file and placed by snapping to any of the grid intersection points on the provided details sheet. The detail is automatically placed, and the process is repeated until the entire sheet is filled. Simple modifications to the details to meet specific job requirements complete the sheet. The designer may also call up the details routine while in any design file, thus enabling detail placement anywhere within a set of drawings.

The CADD Details Library should always be considered a "living" document. This means the library may change as often as twice a year. The Center will occasionally announce a *Call For Details*, giving agency designers an opportunity to implement the format in their everyday work habits. After the details are collected, each Center Field Working Group will meet to review and assemble a new generation of the CADD Details Library. The Center will continue to distribute the new libraries and retrieval software. Through evolution, the library will grow to include all the design disciplines with cost incurred only for technical review, reproduction, and distribution.